Psocoptera (Insecta: Psocodea) from the National Natural Park Gorgona, Cauca, Colombia

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Abstract: The Psocoptera fauna of Gorgona National Natural Park, Colombian pacific, consists of 75 species in 42 genera and 21 families. 1 730 specimens were collected in the period November 2007-June 2011. Five families, 20 genera and nine species are new records for Colombia, and two genera and ten species are new to science. The psocid fauna of the island constitutes an extension of the continental fauna. Rev. Biol. Trop. 62 (Suppl. 1): 243-256. Epub 2014 February 01.

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Psocids (Psocodea: 'Psocoptera'), are small, neopterous, exopterygote insects, characterized by having filiform antennae, bulbous postclypeus, asymmetric mandibles, and maxillae with elongate, free laciniae; the wings are membranous, with simple venation, in most species placed roof-like over the dorsum; apterism and brachypterism are frequent, and the tarsi are 2-3 segmented in the adults and always 2 segmented in the nymphs. For general information on the biology of these insects, see Badonnel (1951), Lienhard (1998), Mockford (1993) and New (1987). For relationships within the order Psocodea, see Bess, Smith, Lienhard & Johnson (2006). They are essentially wild, free living insects that constitute part of the aerial plankton (Simberloff & Wilson, 1969), and represent a significant fraction of the biomass in temperate forests (Thornton, 1985); they are probably key organisms in the trophic network of many ecosystems, as they are prey of many vertebrates and invertebrates, and they are primary consumers, feeding on algae, lichens, mycelia that grow on foliage, tree trunks and rock surfaces, and occasionally on pollen grains (Lienhard, 1998). They are found in living and dead foliage, leaf litter, cortex of trees and shrubs, rock surfaces and human habitations (Mockford, in prep., García-Aldrete, 1990).

It is a diverse group, with more than 5 500 species, in more than 435 valid genera, and more than 40 families (García-Aldrete, 2006). They have been found all over the world, being particularly species rich in the tropics (García-Aldrete, 1988). In Colombia, only a few species have been recorded so far (87 species), but being a megadiverse country, we anticipate that its psocid richness will be comparable to the richness of other neotropical countries, although for most of them the inventory is rather incomplete (see García-Aldrete, 2008, for a list of Mexican Psocoptera, and García-Aldrete & Mockford, 2009, for a list of Brazilian Psocoptera). The Pacific islands of Gorgona and Gorgonilla presently constitute the National

Natural Park (NNP) Gorgona, a protected area in Colombia that was strongly altered anthropogenically in the past, on account of the establishment there of a high security prison, cancelled in 1984. It constitutes a representative area of highly humid tropical forest in the biogeographic Colombian Chocó, quite diverse biologically. The arthropods in general have been little studied, and in this work we present a preliminary list of Psocoptera, with information on the habitats where they have been found, resulting from field work in the NNP Gorgona, between 2007 and 2011.

MATERIAL AND METHODS

The NNP Gorgona belongs to the municipality of Guapi (2°47'-3°6' N, 78°6'-78°18' W), Department of Cauca, in the south of the Colombian Pacific; it includes the islands of Gorgona and Gorgonilla, with an area of 13.8Km^2 and with altitudes from 0 to 338m at Cerro Trinidad (Chamorro, 1990). It presents, as average annuals: temperature 26°C, relative humidity 90%, solar brightness 989.5h, precipitation 6 891.4mm and evaporation 900.2mm (Rangel & Rudas, 1990).

The specimens were taken directly from the substrate, by beating vegetation, by sweeping with a soft brush (3-4 inches wide), tree trunks and rock surfaces, and by sifting leaf litter; the specimens were taken in beating cloths of about 60x60cm, or in plastic, rectangular trays (25x40x10cm), and transferred to containers with 80% ethyl alcohol, utilizing mouth aspirators. Malaise, Shannon and led light traps were also utilized, placing the latter near the canopy, at heights of 15 and 20m. For the identification, it was necessary to dissect the specimens and mount their parts permanently on slides in Canada balsam (see García-Aldrete, 1990 and González-Obando, García-Aldrete & Carrejo, 2011). Table 1 lists the coordinates, altitudes and abbreviations for the collecting localities (Fig. 1) noted for each species.

RESULTS

1 730 specimens were taken, in which 75 species of Psocoptera are represented, in 42 genera and 21 families; six families, 21 genera and 20 species constitute new records for the Colombian fauna, at least ten species are new to science, three of which have just been recently described (García-Aldrete, Gonzalez & Sarria-S 2011). The most diverse family is Psocidae, with eight genera and 18 species, followed by Lepidopsocidae, with five genera and six species; the most speciose genera are *Ectopsocus* (eight species), *Valenzuela* (six species), and *Blastopsocus* (five species); six genera are represented by two species, and 25 genera are represented by one species. Table 2 summarizes densities and the different habitats where the species were collected.

Species List:

Suborder Trogiomorpha

Family Lepidopsocidae

1. *Echmepteryx falco* (Badonnel, 1949)

Records: A1, A4, A8, A11, A13, A14, A15, A16, A17, 12-17.XI.2007, canopy fogging, 30 ♀♀. S.PB, 25.XI.2009, beating foliage, 2 ♀♀. S.PB, 25.XI.2009, in leaf litter, 3 ♀♀. S.FGll, 26.XI.2009, beating foliage, 2 ♀♀. Pd, 24.XI.2009, beating foliage, 91 ♀♀. S.Ch, 21.XI.2009, beating foliage, 6 ♀♀. PGll, 26.XI.2009, on palm trunk and foliage, 12 ♀♀. PB, 19.X.2010, beating foliage, 17 ♀♀. S.PB, 19.X.2010, beating foliage, 1 ♀. PGll, 16.X.2010, beating foliage, 12 ♀♀. PP, 17.X. 2010, beating foliage, 17 ♀♀. Pd, 22.X.2010, beating foliage, 1 ♀. S.Ch, 18.X.2010, beating foliage, 10 ♀♀. S.Ch, 23.X.2010, beating foliage, 7 ♀♀. PP, 24.II.2011, beating foliage, 3 ♀♀. S.PB, 26.II.2011, beating foliage, 5 ♀♀. PGll, 22.II. 2011, beating foliage, 5 ♀♀. PCa, 23.II.2011, beating foliage, 5 ♀♀.

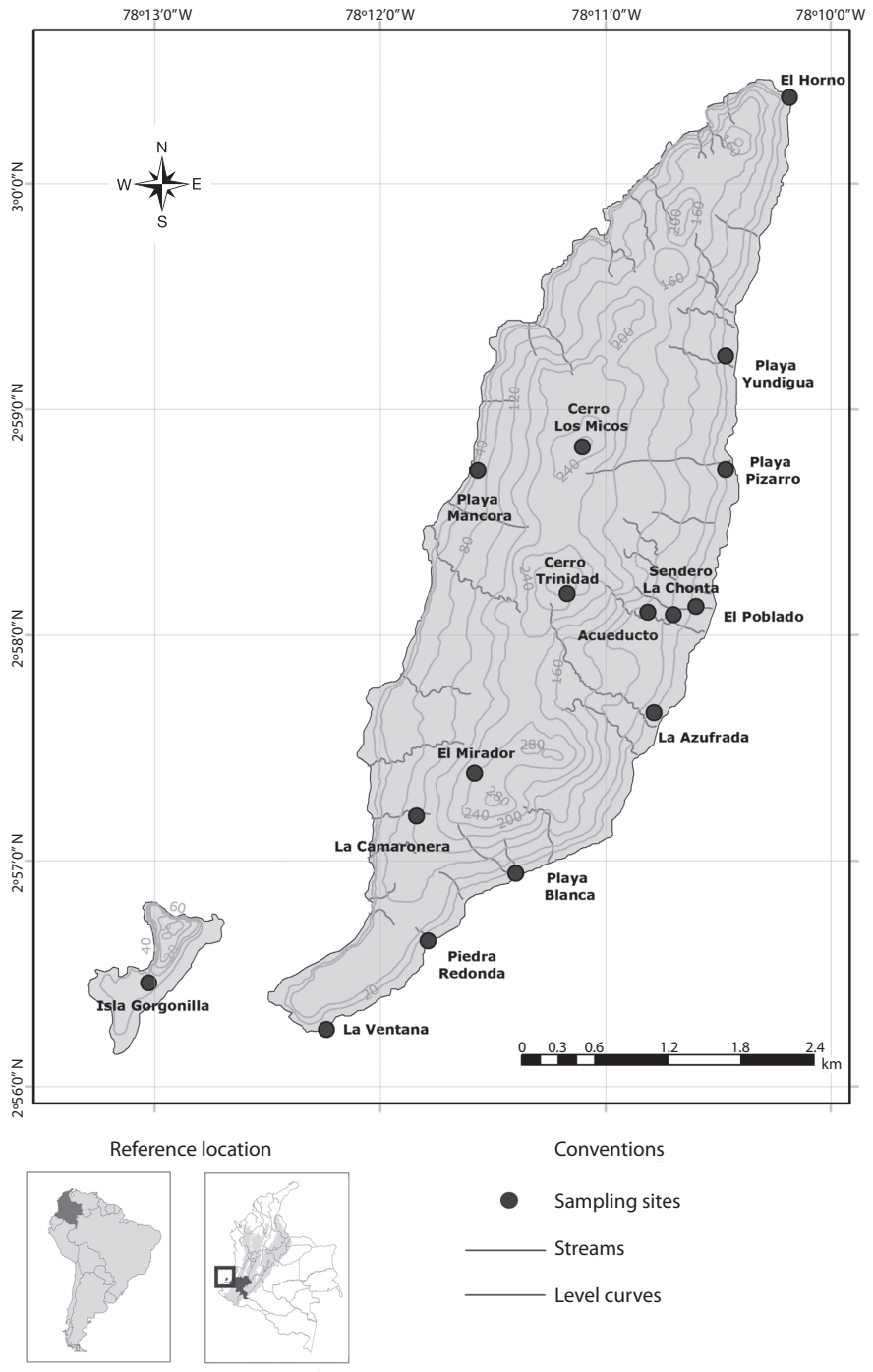

Fig. 1. Sampling locations in PNN Gorgona. Paths between locations are not indicated

TABLE 1
Keys and coordinates of collecting localities in the NNP Gorgona

Key	Description	Coordinates	Meters (asl)
A1	Tree #1	02°57’51.8” N - 78°10’25.9” W	7
A2	Tree #2	02°57’53.9” N - 78°10’32.1” W	16
A3	Tree #3	02°57’53.5” N - 78°10’32.2” W	16
A4	Tree #4	02°57’53.6” N - 78°10’32.0” W	3
A5	Tree #5	02°57’56.2” N - 78°10’31.2” W	3
A6	Tree #6	02°57’56.2” N - 78°10’31.2” W	3
A7	Tree #7	02°57’56.2” N - 78°10’31.2” W	3
A8	Tree #8	02°57’55.9” N - 78°10’27.6” W	2
A9	Tree #9	02°57’54.4” N - 78°10’25.8” W	2
A10	Tree #10	02°57’54.4” N - 78°10’25.8” W	2
A11	Tree #11	02°57’54.4” N - 78°10’25.8” W	2
A12	Tree#12	02°57’54.4” N - 78°10’25.8” W	2
A13	Tree #13	02°58’11.8” N - 78°10’31.5” W	123
A14	Tree #14	02°58’12.3” N - 78°10’32.0” W	117
A15	Tree #15	02°58’13.9” N - 78º10’34.8” W	123
A16	Tree #16	02°58’13.3” N - 78º10’34.6” W	119
Acd	Sendero del Acueducto	02°57’11.9” N - 78°10’13.5” W	100
CM	Cerro de los Micos	02°58’06.4” N - 78°11’33.0” W	246
CMr	Cerro del Mirador	02°57’09.0” N - 78°11’03.6” W	241
CT1	Cerro Trinidad, site 1	02°58’20.3” N - 78º10’43.5” W	169
CT2	Cerro Trinidad, site 2	02º58’13.4” N - 78º10’57.8” W	226
FGll	Faro Gorgonilla	02°57’01.6” N - 78°11’15.2” W	13
PB	Playa Blanca	02°56’52.7” N - 78º11’32.4” W	3
PCa	Playa la Camaronera	02°57’13.3” N - 78°11’48.6” W	5
Pd	El Poblado	02°57’57.7” N - 78°10’24.4” W	21
PGll	Playa Gorgonilla	02°56’39.2” N - 78°12’45.0” W	4
PH	Playa El Horno	03°00’03.0” N - 78°10’21.0” W	68
PP	Playa Palmeras	02°56’38.0” N - 78°12’08.7” W	19
PR	Playa Piedra Redonda	02°56’08.6” N - 78°11’09.4” W	32
PY	Playa Yundigua	02°98’52.8” N - 78º17’05.5” W	7
QC	Quebrada Chorro del Cura	02°58’02.3” N - 78°10’09.0” W	63
S. Ch	Trail El Poblado - Hydroelectric Microcentral- Interpretation Center	Approximately 1Km	N/A
S. FGll	Trail Playa Gorgonilla-Faro.	Approximately 0.5Km	N/A
S. PB	Trail Poblado-Playa Blanca	Approximately 3Km	
S. PP	Trail Playa Redonda-Playa Palmeras	Approximately 1.3Km	51
S. PY	Trail El Poblado - Playa Yundigua	Approximately 2.3Km	N/A

2. *Echmepteryx madagascariensis* (Kolbe, 1885)

Records: S.PB, 25.XI.2009, on dead leaves, 1 ♀. PGll, 26.XI.2009, on palm trunk, 20 ♀♀. Pd, 24.XI.2009, beating foliage, 4 ♀♀. PB, 19.X. 2010, beating foliage, 12 ♀♀. PGll, 16.X.2010, beating foliage, 87 ♀♀. PP, 17.X.2010, beating foliage, 99 ♀♀. Pd, 22.X.2010, beating foliage, 1 ♀. S.Ch, 18.X.2010, beating foliage, 4 ♀♀. PGll, 22.II.2011, beating foliage, 6 ♀♀. PP, 22.II.2011, beating foliage, 2 ♀♀, 2 ♂♂. P.Ca, 23.II.2011, beating foliage, 1 ♀. PP, 24.II.2011, beating foliage, 18 ♀♀, 7 ♂♂.

3. *Lepidopsocus pretiosus* (Banks, 1942)

Records: PGll, 26.XI.2009, beating foliage, 1 ♀. S.Ch, 23.XI.2009, beating foliage, 1 ♀. Pd, 24.XI.2009, beating foliage, 3

TABLE 2
Species of Psocoptera and their habitats. N=number of individuals, a=foliage and branches, b=understory (15-20m, above ground), c=human edifices, d=tree trunks or under webbing, **e**=leaf litter; the asterisk (*) indicate the families, genera and species newly recorded in Colombia

Species	N	Habitat	Species	N	Habitat
LEPIDOPSOCIDAE			*Ectopsocus* sp. 6	1	b
*Echmepteryx falco**	229	a, b, e	*Ectopsocus* sp. 7	1	b
*E. madagascariensis**	264	a, d, e	*Ectopsocus* sp. 8	2	a
Lepidopsocus pretiosus *	17	a	PERIPSOCIDAE		
Lepolepis sp.	4	a, e	*Peripsocus* sp. 1	16	a, b
Proentomum personatum *	3	a	*Peripsocus* sp. 2	10	b
*Nepticulomima hoesemanni**	63	a, c	*Peripsocus* sp. 3	7	a, b
AMPHIENTOMIDAE			*Peripsocus* sp. 4	4	a, b
Seopsocus sp.*	2	b	*Kaestneriella ecuatoriana**	8	a, b
LIPOSCELIDIDAE			ca. *Kaestneriella* sp. (n. gen.)	9	a, b
Belaphotroctes sp.	4	d	ARCHIPSOCIDAE		
Liposcelis sp.	8	b	*Archipsocus* sp.	35	a, b, e
PACHYTROCTIDAE			*Pararchipsocus* sp.*	29	a
Tapinella sp.	3	a	PSEUDOCAECILIIDAE		
EPIPSOCIDAE			*Heterocaecilius* sp.*	123	a, b
Goja sp. (n. sp.)	18	a, d	Pseudocaecilius citricola	12	a, b
Mesepipsocus sp. (n.sp.)*	19	a, c	*Scytopsocus* sp.*	63	a, b
Epipsocus sp. 1*	4	a, e	PHILOTARSIDAE		
Epipsocus sp. 2*	2	b	*Aaroniella* sp.	19	a, b
PTILONEURIDAE			COMPSOCIDAE		
Loneura gorgonaensis	3	b	*Compsocus elegans**	2	b, c
Loneura insularis	6	b	HEMIPSOCIDAE*		
Loneura monticola	6	b	*Hemipsocus africanus* *	26	a
CLADIOPSOCIDAE*			PSOCIDAE		
Cladiopsocus sp.*	16	a, b	*Blaste* sp.	15	a, b
DOLABELLOPSOCIDAE			*Blastopsocus* sp. 1	2	b
Dolabellopsocus sp.	8	a, b	*Blastopsocus* sp. 2	9	a, b
Isthmopsocus n sp.	21	a, b, e	*Blastopsocus* sp. 3	13	a, b
ASIOPSOCIDAE*			*Blastopsocus* sp. 4	4	a, b
Notiopsocus sp. *	1	b	*Blastopsocus* sp. 5	5	b
CAECILIUSIDAE			*Indiopsocus* sp. 1	5	b
Valenzuela sp. 1	11	b	*Indiopsocus* sp. 2	79	a, b
Valenzuela sp. 2	74	a	*Indiopsocus* sp. 3	1	a
Valenzuela sp. 3	51	a, b	*Psococerastis* sp. 1	11	a, b
Valenzuela sp. 4	11	a, b, c	*Psococerastis* sp. 2	6	b
Valenzuela sp. 5	2	a	*Psococerastis* sp. 3	7	a, b, e
Valenzuela sp. 6	7	a, b	*Ptycta* sp. 1*	10	b
STENOPSOCIDAE*			*Ptycta* sp. 2*	20	b
*Graphopsocus cruciatus**	4	b	*Thyrsopsocus* sp. 1*	2	b
LACHESILLIDAE			*Thyrsopsocus* sp. 2*	3	a, b
Lachesilla sp. 1	4	a, b	*Trichadenotecnum* sp.*	2	b
Lachesilla sp. 2	13	a, b	New Genus	3	b
ECTOPSOCIDAE			MYOPSOCIDAE*		
Ectopsocus sp. 1	18	a	*Myopsocus* sp. 1*	32	b
Ectopsocus sp. 2	76	a, d	*Myopsocus* sp. 2*	14	b
Ectopsocus sp. 3	30	a, d	*Lichenomima* sp. 1*	33	a, b
Ectopsocus sp. 4	13	a	*Lichenomima* sp. 2*	55	b
Ectopsocus sp. 5	16	a, d	*Lichenomima* sp. 3*	1	b

♀♀. PP, 17.X.2010, beating foliage, 2 ♀♀. PB, 19.X.2010, beating foliage, 7 ♀♀. PP, 23.II.2011, light trap, 3 ♀♀.

4. *Lepolepis* sp.
Records: S.PB, 25.XI.2009, in leaf litter, 2 ♀♀. PP, 17.X.2010, beating foliage, 1 ♀. PP, 24.II.2011, beating foliage, 1 ♀.

5. *Proentomum personatum* Badonnel, 1949
Records: S.Ch, 23.XI.2009, beating foliage, 1 ♀. S.Ch, 21.XI.2009, beating foliage, 1 ♀. PP, 24.II.2011, beating foliage, 1 ♀.

6. *Nepticulomima hoesemanni* (Enderlein, 1903)
Records: Pd, 26.XI.2009, on house wall, 4 ♀♀. Pd, 24.XI.2009, beating foliage, 1 ♀. Pd, 21.XI.2009, on window wood frame, 4 ♀♀. Pd, 22.XI.2009, on wooden box, 34 ♀♀. Pd, 22.X.2010, on house wall, 13 ♀♀, 6 ♂♂. S.PY, 25.II.2011, beating foliage, 1 ♀.

Suborder Troctomorpha
Family Compsocidae

7. *Compsocus elegans* Banks, 1930
Records: A1, 12.XI.2007, canopy fogging, 1 ♀. Pd, 23.XI.2009, on house wall, 1 ♀.
Family Amphientomidae

8. *Seopsocus* sp.
Records: A11, 14.XI. 2007, canopy fogging, 2 ♂♂.

Family Liposcelididae

9. *Belaphotroctes* sp.
Records: FGll, 26.XI.2009, on iron bar, 4 ♀♀.

10. *Liposcelis* sp.
Record: QC, 29.VI-2.VII.2011, led light trap, 8 ♀♀.

Family Pachytroctidae

11. *Tapinella* sp.
Records: S.Ch, 23.XI.2009, beating foliage, 1 ♀. S.Ch, 18.X.2010, beating foliage, 2 ♀♀.

Suborder Psocomorpha
Family Epipsocidae

12. *Goja* sp.
Records: S.Ch, 21.XI.2009, beating foliage, 1 ♀, 2 ♂♂. P.Gll, 22.II.2011, on tree trunk, 1 ♀, 2 ♂♂. P.Ca, 23.II.2011, on tree trunk, 5 ♀♀, 7 ♂♂.

13. *Mesepipsocus* sp.
Records: Pd, 7.XI.2009, on house wall, 1 ♀, 1 ♂. Pd, 21.XI.2009, on house wall, 2 ♀♀, 1 ♂. Pd, 22.XI.2009, on wooden box, 6 ♂♂. Pd, 24.XI.2009, on palm fronds roof, 1 ♀. Pd, 26.XI.2009, on wooden box, 1 ♀, 2 ♂♂. Pd, 22.XI.2010, on house wall, 3 ♀♀, 1 ♂.

14. *Epipsocus* sp. 1
Record: PB, 19-22.X.2010, Malaise trap, 1 ♂. S.PY, 20-22.X.2010, Malaise trap, 1 ♂. PR, 23-25.II.2011, Malaise trap, 1 ♂. S.PB, 26.II.2011, in leaf litter, 1 ♂.

15. *Epipsocus* sp. 2
Record: PB, 19-22.X.2010, Malaise trap, 1 ♂. CT1, 26.II.2011, led light trap, 1 ♂.

Family Ptiloneuridae

16. *Loneura gorgonaensis* García Aldrete, González & Sarria, 2011
Records: PP, 24-25.II.2011, led light trap, 2 ♂♂. PP, 27.II.-1.III.2011, light trap, 1 ♂.

17. *Loneura insularis* García Aldrete, González & Sarria, 2011
Records: PP, 22-23.II.2011, led light trap, 1 ♂. PP, 24.II.2011, light trap, 3 ♂♂. PY, 27.III.2011, led light trap, 1 ♂. CMr, 28-29.V.2011, led light trap, 1 ♂.

18. *Loneura monticola* García Aldrete, González & Sarria, 2011

Records: CT1, 27.II.-1.III.2011, led light trap, 5 ♂♂. CT, 27.II.-1.III.2011, led light trap, 1 ♂.

Family Cladiopsocidae

19. *Cladiopsocus* sp.

Records: A13, 16.XI.2007, canopy fogging, 1 ♂. PB, 19-22.X.2010, Malaise trap, 1 ♂. CT1, 27.II.2011, light trap, 5 ♂♂. PP, 23.II.2011, light trap, 3 ♂♂. S.PY, 23.II.2011, light trap, 1 ♂. CMr, 24-25.V.2011, light trap, 2 ♂♂. CM, 28-29.V.2011, light trap, 2 ♂♂. S.PY, 17.II.-2.III.2011, light trap, 1 ♂.

Family Dolabellopsocidae

20. *Dolabellopsocus* sp.

Records: A8, A14, 16.XII.2007, canopy fogging, 3 ♀♀. PR, 23-25.II. 2011, Malaise trap, 1 ♀. S.PB, 26.II.2011, 1 ♀. CMr, 24-25.V.2011, led light trap, 1 ♀; Malaise trap, 2 ♂♂.

21. *Isthmopsocus* sp.

Records: S.PB, 23-25.II.2011, Malaise trap, 1 ♀. S.PB, 26.II.2011, in leaf litter, 3 ♀♀, 1 ♂. S.PB, 27.II.2011, in leaf litter, 6 ♀♀, 4 ♂♂. PY, 27.II.-2.III.2011, led light trap, 2 ♂♂. CMr, 24-25.V.2011, led light trap, 4 ♂♂.

Family Asiopsocidae

22. *Notiopsocus* sp.

Records: A14, 16.XI.2007, canopy fogging, 1 ♀.

Family Caeciliusidae

23. *Valenzuela* sp. 1

Records: A1, A3, A10, A15, A16, 12-17.XI.2007, canopy fogging, 3 ♀♀, 2 ♂♂. CMr, 24-25.V.2011, led light trap, 3 ♂♂. CT2, 26-27.V. 2011, led light trap, 3 ♂♂.

24. *Valenzuela* sp. 2

Records: S.Ch, 21 and 23.XI.2009, beating foliage, 2 ♂♂. Pd, 24 and 26.XI. 2009, beating foliage, 26 ♀♀, 17 ♂♂. PP, 17.X.2010, beating foliage, 1 ♀. S.Ch, 18 and 23.XI.2010, beating foliage, 3 ♀♀, 1 ♂. S.Ch, 18-22.X.2010, Malaise trap, 1 ♂. S.PB, 19.X.2010, beating foliage, 6 ♀♀, 6 ♂♂. PB, 19.X.2010, beating foliage, 4 ♀♀, 2 ♂♂. PP, 22.II.2011, beating foliage, 1 ♂. S.PB, 26 and 28.II.2011, beating foliage, 2 ♀♀, 1 ♂. PH, 24.V.2011, beating foliage, 1 ♀.

25. *Valenzuela* sp. 3

Records: A9, A10, A13, A16, 14.XI.2007, canopy fogging, 7 ♀♀, 4 ♂♂. Pd, 24.XI.2009, beating foliage, 10 ♀♀, 3♂♂. PP, 23.II.2011, beating foliage, 2 ♀♀. S.PB, 28.II.-1.III.2011, light trap, 1 ♂. CMr, 24-25.V.2011, light trap, 14 ♀♀, 7 ♂♂. CM, 28-29.V.2011, light trap, 2 ♀♀. CT1, 26-27.V.2011, light trap, 1 ♀.

26. *Valenzuela* sp. 4

Records: A1, 12.XI.2007, canopy fogging, 1 ♂. A8, 14.XI.2007, canopy fogging, 1 ♀. Pd, 24.XI.2009, beating foliage, 5 ♀♀, 1 ♂. Pd, 26.XI.2009, beating foliage, 1 ♀. Pd, 22.X.2010, on house wall, 1 ♂. Acd, 26.II.-1.III.2011, Malaise trap, 1 ♂.

27. *Valenzuela* sp. 5

Records: Pd, 26.XI.2009, beating foliage, 1 ♀. PP, 17.X.2010, beating foliage, 1 ♀.

28. *Valenzuela* sp. 6

Records: PP, 23.II.2011, beating foliage, 1 ♂. CMr, 24-25.V.2011, led light trap, 1 ♀, 4 ♂♂. CM, 28-29.V.2011, led light trap, 1 ♂.

Family Stenopsocidae

29. *Graphopsocus cruciatus* (Linnaeus, 1768)

Record: A15, 17.XI.2007, canopy fogging, 3 ♀♀, 1 ♂.

Family Lachesillidae

30. *Lachesilla* sp. 1

Record: S.Ch, 21-22.X.2010, led light trap, 1 ♂. S.Ch, 23.X.2010, beating foliage, 2 ♀♀, 1 ♂.

31. *Lachesilla* sp. 2

Records: S.PB, 19.X.2010, 2 ♀♀, 1 ♂. PP, 23.II.2011, beating foliage and led light trap, 1 ♀, 2 ♂♂. CT1, 27.II.-1.III.2011, led light trap, 1 ♀, 1♂. CMr, 24-25.V.2011, led light trap, 1 ♀. PR, 26.II.2011, beating foliage, 1 ♀. Acd, 25-26.V.2011, led light trap, 1 ♂. CT2, 26-27.V.2011, led light trap, 2 ♂♂.

Family Ectopsocidae

32. *Ectopsocus* sp. 1

Records: PGll, 16.X.2010, beating foliage, 5 ♀♀, 4 ♂♂. S.PB, 25.XI.2009, in leaf litter, 2 ♀♀. S.FGll, 26.XI.2009, in leaf litter, 1 ♀. PGll, 26.XI.2009, beating foliage, 5 ♀♀. PB, 19.X.2010, beating foliage, 1♀.

33. *Ectopsocus* sp. 2

Records: PGll, 26.XI.2009, on palm trunk, 32 ♀♀, 30 ♂♂. PGll, 16.X.2010, beating foliage, 7 ♀♀, 7 ♂♂.

34. *Ectopsocus* sp. 3

Records: PGll, 26.XI.2009, on palm trunk, 1 ♀. Pd, 21.XI.2009, beating foliage, 5 ♀♀. PGll, 16.X.2010, beating foliage, 9 ♀♀, 14 ♂♂. PCa, 23.II. 2011, beating foliage, 1 ♀.

35. *Ectopsocus* sp. 4

Records: PGll, 16.X.2010, beating foliage, 1 ♂. S.PB, 19.X.2010, beating foliage, 6 ♀♀, 6 ♂♂.

36. *Ectopsocus* sp. 5

Records: Pd, 24.XI.2009, beating foliage, 5 ♀♀, 3 ♂♂. PGll, 26.XI.2009, on tree trunk, 1 ♀. PP, 17.X.2010, beating foliage, 2 ♀♀, 2 ♂♂. PB, 19.X.2010, beating foliage, 1 ♂. PP, 24.II.2011, beating foliage, 2 ♀♀.

37. *Ectopsocus* sp. 6

Records: CMr, 24-25.V.2011, led light trap, 1 ♂.

38. *Ectopsocus* sp. 7

Records: PP, 23.II.2011, light trap, 1 ♀.

39. *Ectopsocus* sp. 8

Record: S.Ch, 6.VII.2011, on tree trunk with ant's nest, 2 ♀♀.

Family Peripsocidae

40. *Peripsocus* sp. 1

Records: A11, 14.XI.2007, canopy fogging, 2 ♀♀. A16, 17.XI.2007, canopy fogging, 2 ♂♂. Pd, 22.XI.2009, beating foliage, 5 ♀♀. Pd, 24.XI. 2009, beating foliage, 4 ♀♀. PGll, 26.XI.2009, beating foliage, 1 ♀. PGll, 16.X.2010, beating foliage, 1 ♀. PP, 24.II.2011, led light trap, 1 ♂.

41. *Peripsocus* sp. 2

Records: CMr, 24-25.V.2011, led light trap, 1 ♀, 3 ♂♂. S.PB, 27.II.-.III.2011, led light trap, 1 ♂. CT1, 27.II.-2III.2011, led light trap, 3 ♂♂. CM, 28-29.V.2011, led light trap, 2 ♂♂.

42. *Peripsocus* sp. 3

Records: PP, 23.II.2011, beating foliage, 1 ♂. Acd, 25-26.V.2011, led light trap, 3 ♂♂. CT1, 27.II.-2.III.2011, led light trap, 2 ♂♂. CM, 28-29.V.2011, led light trap, 1 ♂.

43. *Peripsocus* sp. 4

Records: S.PB, 26.II.2011, beating foliage, 1 ♀. S.PB, 28.II.2011, beating foliage, 1 ♂. S.PP, 24-25.II.2011, led light trap, 2 ♂♂.

44. *Kaestneriella ecuatoriana* García Aldrete, 1989

Records: PP, 23.II.2011, beating foliage, 1 ♂. S.PB, 28.II.-1.III.2011, led light trap, 5 ♂♂. CM, 28-29.V.2011, led light trap, 2 ♂♂.

45. Genus ca. *Kaestneriella*

Records: A14, A15, 17.XI.2007, canopy fogging, 2 ♀♀. Pd, 24.II.2009, beating foliage, 3 ♀♀. PGll, 26.XI.2009, beating foliage, 1 ♀. PP, 17.X. 2010, beating foliage, 1 ♀. PP, 23.II.2011, beating foliage, 2 ♀♀.

Family Archipsocidae

46. *Archipsocus* sp.

Records: A4, 13.XI.2007, canopy fogging, 1 ♀. A5, A11, 14.XI.2007, canopy fogging, 2 ♀♀. A16, 17.XI.2007, canopy fogging, 6 ♀♀. S.Ch, 23.XI. 2009, beating foliage, 2 ♀♀. Pd, 24.XI.2009, beating foliage, 10 ♀♀. PGll, 26.XI.2009, on palm trunk, 2 ♀♀. PGll, 16.X.2010, beating foliage, 7 ♀♀, 2 ♂♂. PB, 19.X.2010, beating foliage, 1 ♀. S.PB. 23.II.2011, in leaf litter, 1 ♂. S.PB. 28.II.2011, in beating foliage, 1 ♀.

47. *Pararchipsocus* sp.

Records: PGll, 16.X.2010, beating foliage, 11 ♀♀, 12 ♂♂. PGll, 16-18.X.2010, Malaise trap, 1 ♀. PP, 17.X.2010, beating foliage, 2 ♀♀, 3 ♂♂.

Family Pseudocaeciliidae

48. *Heterocaecilius* sp.

Records: A1, 12.XI.2007, canopy fogging, 1 ♀. Pd, 24.XI.2009, beating foliage, 5 ♀♀. Pd, 26.XI.2009, beating foliage, 1 ♀, 3 ♂♂. PGll, 26.XI. 2009, beating foliage, 4 ♀♀. PGll, 16.X.2010, beating foliage, 32 ♀♀, 17 ♂♂. PP, 17.X.2010, 30 ♀♀, 22 ♂♂. S.Ch, 18.X.2010, 1 ♀, 2 ♂♂. PB, 19.X.2010, beating foliage, 1 ♂. PP, 24.II.2011, beating foliage, 4 ♂♂.

49. *Pseudocaecilius citricola* (Ashmead, 1879)

Records: A1, 12.XI.2007, canopy fogging, 3 ♀♀. A10, 14.XI.2007, canopy fogging, 1 ♀. Pd, 24.XI.2009, beating foliage, 2 ♀♀. PGll, 26.XI. 2009, beating foliage, 4 ♀♀. PP, 17.X.2010, beating foliage, 2 ♀♀.

50. *Scytopsocus* sp.

Records: A1, 12.XI.2007, canopy fogging, 4 ♀♀. A2, A3, 13.XI.2007, canopy fogging, 5 ♀♀, 3 ♂♂. A8, A10, A11, 14.XI.2007, canopy fogging, 2 ♀♀, 1 ♂. A14, A15, A16, 17.XI.2007, canopy fogging, 6 ♀♀, 2 ♂♂. PGll, 16.X.2010, beating foliage, 4 ♀♀. PP, 17.X.2010, beating foliage, 5 ♀♀. S.Ch, 18-19.X.2010, led light trap, 3 ♂♂. PB, 19.X.2010, beating foliage, 1 ♀. S.Ch, 21-22.X.2010, these, and the following specimens, taken in led light traps, 4 ♂♂. PP, 23.II.2011, 1 ♂. S.PP, 24-25.II.2011, 1 ♂. PY, 27.II.-1.III. 2011, 1 ♂. CT1, 28.II.-2.III.2011, 1 ♂. PY, 28.II.-1.III.2011, 1 ♂. CMr, 24-25.V. 2011, 9 ♂♂. Acd, 25-26.V.2011, 4 ♂♂. CT2, 26-27.V.2011, 2 ♂♂. CM, 28-29.V. 2011, 3 ♂♂.

Family Philotarsidae

51. *Aaroniella* sp.

Records: A3, 13.XI.2007, canopy fogging, 2 ♀♀, 1 ♂. A11, 14.XI.2007, canopy fogging, 5 ♀♀. A14, 16.XI.2007, canopy fogging, 1 ♀. PGll, 17.X. 2010, beating foliage, 1 ♂. PP, 17.X.2010, 1 ♀, 1 ♂. PP, 23.II.2011, light trap, 4 ♀♀, 2 ♂♂. PGll, 22.II.2011, beating foliage, 1 ♀.

Family Hemipsocidae

52. *Hemipsocus africanus* Enderlein, 1907

Records: PGll, 26.XI.2009, beating foliage, 18 ♀♀, 6 ♂♂. PGll, 16.X.2010, beating foliage, 1 ♀. PB, 19.X.2010, beating foliage, 1 ♂.

Familia Psocidae

53. *Blaste* sp.

Records: A11, 14.XI.2007, canopy fogging, 1 ♀. A13, 16.XI.2007, canopy fogging, 1 ♀. A15, 17.XI.2007, canopy fogging, 3 ♀♀. PP, 17.X.2010, beating foliage, 3 ♀♀, 1 ♂. PB, 19.X.2010, beating foliage, 3 ♀♀, 1 ♂. PB, 19-22.X.2010, 1 ♂. S.Ch, 21-22.X.2010, led light trap, 1 ♀.

54. *Blastopsocus* sp. 1

Records: A11, 14.XI.2007, canopy fogging, 1 ♀. A15, 17.XI.2007, canopy fogging, 1♀.

55. *Blastopsocus* sp. 2

Records: A4, 13.XI.2007, canopy fogging, 1 ♀. A11, 14.XI.2007, canopy fogging, 2 ♀♀. PP, 23.II.2011, led light trap, 1 ♀, 1 ♂. CT1, 27.II.-1.III.2011, led light trap, 2 ♂♂.

CMr, 24-31.V.2011, Malaise trap, 1 ♂. CM, 28-29.V.2011, led light trap, 1 ♂.

56. *Blastopsocus* sp. 3

Records: A5, 14.XI.2007, canopy fogging, 1 ♀. S.Ch, 21-22.X.2010, led light trap, 1 ♂. PGll, 22.II.2011, beating foliage, 7 ♀♀, 3 ♂♂. CMr, 24-25.V.2011, led light trap, 1 ♀.

57. *Blastopsocus* sp. 4

Records: PP, 22.II.2011, beating foliage, 1 ♀. PP, 23.II.2011, led light trap, 1 ♂. CT1, 27.II.2011, led light trap, 2 ♂♂.

58. *Blastopsocus* sp. 5

Records: A11, 14.XI.2007, canopy fogging, 1 ♂. A14, 17.XI.2007, canopy fogging, 1 ♂. Acd, 25-26.V.2011, led light trap, 1 ♂. CM, 28-29.V.2011, led light trap, 2 ♂♂.

59. *Indiopsocus* sp. 1

Records: A13, 14.XI.2007, canopy fogging, 4 ♀♀. A15, 17.XI.2007, canopy fogging, 1 ♀.

60. *Indiopsocus* sp. 2

Records: A11, 14.XI.2007, canopy fogging, 1 ♀. A15, 17.XI.2007, canopy fogging, 2 ♂♂. Pd, 24.XI.2009, beating foliage, 14 ♀♀. PP, 17.X. 2010, beating foliage, 9 ♀♀, 2 ♂♂. S.Ch, 18-19.X.2010, led light trap, 3 ♂♂. S.Ch, 21-22.X.2010, led light trap, 1 ♀, 9 ♂♂. PB, 19.X.2010, beating foliage, 1 ♂. S.PY, 20.X.2010, led light trap, 2 ♂♂. PP, 23.II. 2011, led light trap, 1 ♂. S.PP, 24-25.II.2011, led light trap, 1 ♂. S.PB, 26.II.2011, beating foliage, 1 ♀. PY, 27.II.-1.III.2011, led light trap, 4 ♂♂. CT1, 27.II.-1.III.2011, led light trap, 2 ♂♂. S.PB, 28.II.-1.III. 2011, led light trap, 18 ♂♂. CMr, 24-25.V.2011, led light trap, 3 ♂♂. Acd, 25-26.V.2011, led light trap, 1 ♂. CM, 28-29.V.2011, led light trap, 4 ♂♂.

61. *Indiopsocus* sp. 3

Record: PB, 19-22.X. 2010, Malaise trap, 1 ♂.

62. *Psococerastis* sp. 1

Records: A15, A16, 17.XI.2007, canopy fogging, 5 ♀♀. S. PB, 24.II.2011, direct capture, 1 ♀. S.PY, 27.II.2011, direct capture, 1 ♀. CT1, 27.II.-1.III.2011, led light trap, 3 ♀♀, S.PB, 1 ♀.

63. *Psococerastis* sp. 2

Records: A15, 17.XI.2007, canopy fogging, 1 ♂. CT1, 27.II.-1.III.2011, led light trap, 2 ♂♂. PY, 27.II.-1.III.2011, led light trap, 1 ♂. S.PB, 28.II.-1.III.2011, led light trap, 2 ♂♂.

64. *Psococerastis* sp. 3

Records: S.FGll, 26.XI.2009, beating foliage, 4 ♀♀, 1 ♂. PGll, 22.II.2011, in leaf litter, 1 ♂. CMr, 24.V.2011, direct capture, 1 ♀.

65. *Ptycta* sp. 1

Records: A1, 12.XI.2007, canopy fogging, 1 ♂. A13, 16.XI.2007, canopy fogging, 4 ♀♀. CMr, 24-25.V.2011, led light trap, 1 ♀, 3 ♂♂. CM, 28-29.V.2011, led light trap, 1 ♂.

66. *Ptycta* sp. 2

Records: A15, 17.XI.2007, canopy fogging, 1 ♂. PP, 23.II.2011, light trap, 1 ♀, 1 ♂. CT1, 27.II.-1.III.2011, led light trap, 1 ♂. PY, 27.II.-1.III.2011, led light trap, 1 ♂. CMr, 24-25.V.2011, light trap, 5 ♀♀, 7 ♂♂. CM, 28-29.V.2011, led light trap, 3 ♂♂.

67. *Thyrsopsocus* sp. 1

Records: A3, 13.XI.2007, canopy fogging, 1 ♂. A11, 14.XI.2007, canopy fogging, 1 ♀.

68. *Thyrsopsocus* sp. 2

Records: S.Ch, 18.X.2010, beating foliage, 1 ♂. CT1, 28.II.2011, led light trap, 2 ♂♂.

69. *Trichadenotecnum* sp.

Records: A2, 13.XI.2007, canopy fogging, 1 ♂. CM, 28-29.V.2011, light trap, 1 ♂.

70. Psocidae New Genus (?)

Records: A8, A11, 14.XI.2007, canopy fogging, 1 ♀, 1 ♂. A15, 17.XI.2007, canopy fogging, 1 ♂.

Family Myopsocidae

71. *Myopsocus* sp. 1

Records: A2, A3, 13.XI.2007, canopy fogging, 2 ♀♀, 3 ♂♂. A13, 16.XI.2007, canopy fogging, 2 ♀♀. A14, A16, 17.XI.2007, canopy fogging, 3 ♀♀. PP, 23.II.2011, these and the following specimens taken in led light traps, 4 ♀♀. PP, 24.II.2011, 1 ♀. S.PP, 24-25.II.2011, 1 ♀. CT1, 27.II.-1.III.2011, 5 ♀♀, 1 ♂. S.PB, 28.II. 2011, 2 ♀♀, 1 ♂. CMr, 24-25.V.2011, 2 ♀♀, 2 ♂♂. Acd, 25-26.V.2011, 2 ♀♀. PY, 27.II.-1.III.2011, 1 ♀.

72. *Myopsocus* sp. 2

Records (all taken in led light traps): PP, 23.II.2011, 1 ♂. CMr, 24-25.V.2011, 6 ♀♀, 3 ♂♂. CM, 28-29.V.2011, 3 ♀♀, 1 ♂.

73. *Lichenomima* sp. 1

Records: PB, 19.X.2010, beating foliage, 2 ♀♀. PB, 19-22.X.2010, Malaise trap, 1 ♂. S.PB, 28.II.2011, led light trap, 1 ♀. CMr, 24-25.V. 2011, led light trap, 9 ♀♀, 19 ♂♂. CM, 28-29.V.2011, led light trap, 1 ♀.

74. *Lichenomima* sp. 2

Records: CMr, 24-25.V.2011, led light trap, 12 ♀♀, 41 ♂♂. CT2, 26-27.V.2011, led light trap, 1 ♀, 1 ♂.

75. *Lichenomima* sp. 3

Record: CMr, 24-25.V.2011, led light trap, 1 ♀.

DISCUSSION

The distribution of the abundance of the species found follows the usual pattern of a few species represented by many individuals, many species represented by one or few individuals, and a middle group of species with intermediate values (Table 3). Given the close proximity of Gorgona Island to the mainland, separated by only 35km, it is not surprising that the species richness be quite high; in comparison with other islands in the Mexican Pacific is meaningful, as it shows that, according to the theory of island biogeography (MacArthur & Wilson, 1967), small islands have fewer species than large islands, and distant islands have fewer species than close islands to the mainland (Table 4, García-Aldrete, 1986; García Aldrete, Cadena-Carrión & Cervantes-Peredo, 1992); unfortunately, we still do not have a good psocid census of the mainland near the NNP Gorgona, but the evidence we have indicates that, most probably, the level of endemism is low, so far with only *Lepolepis* sp., *Goja* sp., the three species of *Loneura*, the genus ca. *Kaestneriella*, and the new genus of Psocidae as probable endemics to NNP Gorgona, so it would seem that the island fauna is an extension of the continental fauna. An interesting feature of the fauna, comparing it with the other Pacific islands, is that only one species, the widely distributed *Pseudocaecilius citricola* (Ashmead), is shared among the five islands (Table 4).

Of particular interest are the records of *Lepidopsocus pretiosus* Banks and *Nepticulomima hoesemanni* Enderlein in the NNP Gorgona; the former was known from Guam, Micronesia, Christmas Island, Indonesia, Melanesia and Polynesia, and the latter was known from several African countries and from Christmas Island, and was recently recorded at the Waorani Ethnic Reserve, in Napo, Ecuador (Lienhard & Smithers, 2002; García-Aldrete, 2001).

The most abundant species were *Echmepteryx madagascariensis* (Kolbe), *E. falco* Badonnel, and *Heterocaecilius* sp., that together, account for 35.6% of the specimens collected. The first two are pantropical, and are among the first colonizers of secondary vegetation in the Pacific (Thornton, 1985), which may explain their presence and abundance in the NNP Gorgona. They were found throughout the island, but were most abundant at the beaches and near the small town, where the density of coconut palms is high; this agrees with the finding of Thornton et al. (1988), on Java, Indonesia, where they found lepidopsocids mostly on dead palm fronds.

The diversity of Psocoptera in the biogeographic Chocó is unknown, but upon comparing the genera found in the NNP Gorgona, with

TABLE 3
Relative abundance of Psocoptera species from the NNP Gorgona (2007-2011)

Species	N	%
E. madagascariensis	264	15.26
Echmepteryx falco	229	13.24
Heterocaecilius sp.	123	7.11
Indiopsocus sp. 2	79	4.57
Ectopsocus sp. 2	76	4.39
Valenzuela sp. 2	74	4.28
Nepticulomima hoesemanni, *Scytopsocus* sp.	63	3.64
Lichenomima sp. 2	55	3.18
Valenzuela sp. 3	51	2.95
Archipsocus sp.	35	2.02
Lichenomima sp. 1	33	1.91
Myopsocus sp. 1	32	1.85
Ectopsocus sp. 3	30	1.73
Pararchipsocus sp.	29	1.68
Hemipsocus africanus	26	1.50
Isthmopsocus n. sp.	21	1.21
Ptycta sp. 2	20	1.16
Mesepipsocus sp. (n.sp.), *Aaroniella* sp.	19	1.10
Goja sp. (n. sp.), *Ectopsocus* sp. 1	18	1.04
Lepidopsocus pretiosus	17	0.98
Cladiopsocus sp., *Ectopsocus* sp. 5, *Peripsocus* sp. 1	16	0.92
Blaste sp.	15	0.87
Myopsocus sp. 2	14	0.81
Lachesilla sp. 2, *Ectopsocus* sp. 4, *Blastopsocus* sp. 3	13	0.75
Pseudocaecilius citricola	12	0.69
Valenzuela sp. 1, *Valenzuela* sp. 4, *Psococerastis* sp. 1, *Peripsocus* sp. 2	11	0.64
Peripsocus sp. 2, *Ptycta* sp. 1	10	0.58
ca. *Kaestneriella* sp. (n. gen.), *Blastopsocus* sp. 2	9	0.52
Liposcelis sp., *Dolabellopsocus* sp., *Kaestneriella ecuatoriana*	8	0.46
Valenzuela sp. 6, *Peripsocus* sp. 3, *Psococerastis* sp. 3	7	0.40
Loneura insularis, *Loneura monticola*, *Psococerastis* sp. 2	6	0.35
Blastopsocus sp. 5, *Indiopsocus* sp. 1	5	0.29
Lepolepis sp., *Belaphotroctes* sp., *Epipsocus* sp. 1, *Graphopsocus cruciatus*, *Lachesilla* sp. 1, *Peripsocus* sp. 4, *Blastopsocus* sp. 4	4	0.23
Proentomum personatum, *Tapinella* sp., *Loneura gorgonaensis*, *Thyrsopsocus* sp. 2, New Genus.	3	0.17
Seopsocus sp., *Epipsocus* sp. 2, *Valenzuela* sp. 5, *Ectopsocus* sp. 8, *Compsocus elegans*, *Blastopsocus* sp. 1, *Thyrsopsocus* sp. 1, *Trichadenotecnum* sp.	2	0.12
Notiopsocus sp., *Ectopsocus* sp. 6, *Ectopsocus* sp. 7, *Indiopsocus* sp. 3, *Lichenomima* sp. 3	1	0.06

those recorded in Colombia, we found an index of faunistic similarity of 42%, meaningful but preliminary, and likely to go down, as the Colombian fauna gets to be better known. Also, upon comparing Fisher's α diversity index for the psocids of the NNP Gorgona, with the values for other areas (Table 5), such as Fortuna, Panama, and the Krakatau archipelago, with areas of 195 and 25.4Km^2 respectively, we found a relatively high value, given the small area of the NNP Gorgona (13.8Km^2).

In Colombia, 21 families, 42 genera and 87 species have been recorded (Lienhard & Smithers, 2002; García-Aldrete et al., 2011a;

TABLE 4
Number of species of Psocoptera (S), area (Km^2), and distance to mainland (DM, Km) in five Pacific islands

Island	S	Area (Km^2)	DM (Km)
María Madre	48	144	128
San Juanito	16	8	152
Socorro	19	167	704
Clarión	6	25	1076
Gorgona Island	75	13.8	35

TABLE 5
Richness of Psocoptera and relation to area

Locality	Area (Km^2)	α de Fisher
Barro Colorado (Panamá) (Broadhead & Wolda, 1985)	15.64	24.6
Chamela (Jalisco, México) (García Aldrete, 1988)	500	24.01
Fortuna (Panama) (Broadhead & Wolda, 1985)	195	14.8
Krakatoa Islands (Indonesia) (Thornton *et al*., 1988)	25.4	16.7
Los Tuxtlas (Veracruz, México) (García Aldrete *et al*., 1997)	150	32.45
NNP Gorgona (this study)	13.8	15.9

García-Aldrete, González & Sarria-S, 2011; González et al., 2011). Accordingly, families Asiopsocidae, Compsocidae, Hemipsocidae, Myopsocidae and Stenopsocidae constitute new records for the country, raising to 26 the number of families for the country. The genera *Cladiopsocus*, *Echmepteryx*, *Epipsocus*, *Graphopsocus*, *Hemipsocus*, *Heterocaecilius*, *Kaestneriella*, *Lepidopsocus*, *Lichenomima*, *Mesepipsocus*, *Myopsocus*, *Nepticulomima*, *Notiopsocus*, *Pararchipsocus*, *Proentomum*, *Ptycta*, *Scytopsocus*, *Seopsocus*, *Thyrsopsocus* and *Trichadenotecnum* raise to 62 the number of genera for the country; in addition, we found two genera and ten species new to science.

In summary, the psocid fauna of the NNP Gorgona requires further study, to identify to species level, and to verify which of the species are undescribed. The rich psocid fauna of the NNP Gorgona, as compared to the psocid fauna of other Pacific islands, particularly the Mexican Tres Marías and Revillagigedo archipelagos, and the closeness to the continent, indicates that its fauna is an extension of the continental fauna. To ascertain the point above requires a psocid survey of the continental fauna in the area closest to the NNP Gorgona.

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RESUMEN

La fauna de Psocoptera (Psocodea) del Parque Nacional Natural Gorgona, consiste de 75 especies en 42 géneros y 21 familias. 1 730 especimenes fueron recolectados en el periodo entre noviembre de 2007 y junio de 2011. Cinco familias, 20 géneros y nueve especies son nuevos registros para Colombia, y dos géneros y diez especies son nuevos para la ciencia. La fauna de Psocoptera de la isla constituye una extensión de la fauna continental.

Palabras clave: Costa del Pacífico, Colombia, los parques nacionales naturales, la lista de especies.

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